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Divyansh Mishra
Research Scholar, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Ravikesh Kumar Pal
Assistant Professor, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Naveen Kumar Maurya
Assistant Professor, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Prahalad Singh
Research Scholar, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Gurjeet Singh
Research Scholar, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Corresponding Author:
Divyansh Mishra
Research Scholar, Department of Agronomy, Faculty of Agricultural Sciences and Allied Industries, Rama University, Kanpur, Uttar Pradesh, India

Effect of phosphorus and molybdenum on growth and yield of black gram (*Vigna mungo* L.)

Divyansh Mishra, Ravikesh Kumar Pal, Naveen Kumar Maurya, Prahalad Singh and Gurjeet Singh

Abstract
A field experiment was conducted at an Agricultural Farm Rama University, Kanpur 209217 (U.P) India during *Rabi* season of year 2021-22. The soil at the test location was clay loamy, with low amounts of organic carbon and available nitrogen, available phosphorus, and medium in available potassium with a moderate alkaline (8.2 pH). The experiment was laid out in Randomized Block design with three replications. Ten treatments *viz.* T_1-Phosphorus 30 kg/ha + Mb 0.5 kg/ha, T_2-Phosphorus 30 kg/ha+ Mb 1.0 kg/ha, T_3-Phosphorus 30 kg/ha + Mb 1.5 kg/ha, T_4-Phosphorus 40 kg/ha+ Mb 0.5 kg/ha, T_5-Phosphorus 40 kg/ha + Mb 1.0 kg/ha, T_6-Phosphorus 40 kg/ha + Mb 1.5 kg/ha, T_7-Phosphorus 50 kg/ha + Mb 0.5 kg/ha, T_8-Phosphorus 50 kg/ha+ Mb 1.0 kg/ha, T_9-Phosphorus 50 kg/ha + Mb 1.5 Kg/ha and T_{10}-Only Recommended Dose of Fertilizer (RDF) were allocated in randomly. Higher growth attributing characters (plant height and dry matter accumulation) and yield attributing characters at harvest number of pods plant^{-1}, Length of pods (cm^{-1}), number of seed pods^{-1} and test weight (G) were produced in black gram with T_{10}-Only Recommended Dose of Fertilizer (RDF) treatment. Similarly, higher seed, straw, biological yield, highest harvest index along with net monetary income was recorded under Recommended Dose of Fertilizer in black gram crop; However, Highest benefit cost ratio (21.9) produced under T_9 - Phosphorus 50 kg/ha + Mb 1.5 Kg/ha treatment.

Keywords: INM, FYM, growth attribute, vermicompost, linseed and yield

Introduction
(*Vigna mungo* L.), belongs to the leguminosae family and is one of the most important leguminous crop cultivated throughout the country. The culture is tolerant of adverse weather conditions and improves soil fertility by fixing atmospheric nitrogen in the soil Pulsed black grams play an important role in the Indian diet as they contain plant-based protein and grain-based supplements. It contains about 26% protein, almost three times as much as grains and other minerals and vitamins. Fat-1.4%. Minerals-3.2% Fiber-0.9% Carbs-59.6%. Calcium-154mg/100g. Phosphorus: 385mg/100g, Iron: 9.1mg/100g, Moisture: 10.9% It is also used as a nutritional feed for dairy cows. Yields were reported to be equivalent to 22.10 kg N/ha, which is estimated to make up for 59,000 tons of urea per year.

Phosphorus is a key element involved in various functions in growth and metabolism of pulses. It is frequently a major limiting nutrient for plant growth in most Indian soils. Phosphorus deficiency is usually the key factor for seed yield of pulse crops on all soil types. Out of 135 districts under pulses, soils in 68 districts are low and 62 districts are medium in available P status. The application of Phosphorus to pulse crops must be one of the most important strategies to increase productivity of pulses in India. Mainly mung bean uptake around 24 kg P_2O, while chickpea and black gram uptake around 10 kg P_2O/ha. This variation among crops due to variation in the length of growing season and yield. Yield of pulses can significantly be increased by applying P on the basis of soil test information. P applied to pulses crops may yield residual effect up to a limit of 20-35 kg PO/ha. The degree of response to applied P can further be improved through management *viz*., timely sowing, maintenance of optimum plant population, proper moisture maintenance and effective pest and weed management practices (Shweta and Manu Malik 2014) [7]. The symbiotic bacterial enzyme nitrogenase is comprised of Mo-Fe protein which is directly involved in the reduction of $N_2$to NH_2during fixation process. Supply of Mo to bacteroids is therefore an important process and most likely a key regulatory component in the maintenance of nitrogen fixation in legumes that may influence plant growth (Kaiser 2005).

Materials and Methods

The field experiment was carried out in the *Rabi* season of 2021-2022 at the Rama University's Mandhana Agricultural Research Farm in Kanpur Nagar, Uttar Pradesh, which is located in the Indo-Gangatic Plain's alluvial tract in the central part of the state between $25^0$26′ and $26^0$58′ North latitude and $79^0$31′ to $31^0$34′ East longitude at an altitude of 125.9 meters. This farm has sufficient irrigation facilities accessible. On the university's main campus, the farm is located. The lowest temperature during the growing season is between 6 and 21.7^{0}C, while the highest temperature during that time is between 17 and 35.1^{0}C. During the cropping period, relative humidity ranged from 24 to 94 percent. During the trial, average wind speeds ranged from 1.3 to 6.3 km hr^{-1}. During the testing period, the trail location got a total of 43.2 mm of rain in one wet day, providing favourable conditions for crop development. The experiment was laid out in Randomized Block Design with three replications Ten treatments *viz.* T_1-Phosphorus 30 kg/ha + Mb 0.5 kg/ha, T_2-Phosphorus 30 kg/ha+ Mb 1.0 kg/ha, T_3-Phosphorus 30 kg/ha + Mb 1.5 kg/ha, T_4-Phosphorus 40 kg/ha+ Mb 0.5 kg/ha, T_5-Phosphorus 40 kg/ha + Mb 1.0 kg/ha, T_6-Phosphorus 40 kg/ha + Mb 1.5 kg/ha, T_7-Phosphorus 50 kg/ha + Mb 0.5 kg/ha, T_8-Phosphorus 50 kg/ha+ Mb 1.0 kg/ha, T_9-Phosphorus 50 kg/ha + Mb 1.5 Kg/ha and T_{10}-Only Recommended Dose of Fertilizer (RDF). All plots of experiment was equally fertilized with recommended dose of fertilizers according to different doses of fertilizers. The sources of nitrogen, phosphorus and potassium were urea, di-ammonium phosphate and murate of potash, respectively. The soil at the test location was clay loamy, with low amounts of organic carbon (0.40%), available nitrogen (165.83 kg ha^{-1}), available phosphorus (19.73 kg ha^{-1}) and available potash (266.27 kg ha^{-1}) with a moderate response that was somewhat alkaline (8.2 pH). The experimental crop was sown using the black gram at a seed rate of 12 kg ha-^{1} and a row-to-row spacing of 30 cm. The seed was treated with Vitavax at a rate of 2.5 g kg^{-1} prior to planting. A test crop was watered with irrigation as per requirement of crop. For weed management cost-effective chemical weed-management approach was adopted where Pendimethalin was sprayed at 2 days after sowing.

Results and Discussion

Effect of treatments on growth attribute of black gram

Data showed in (Table 1); The effect of application phosphorus and molybdenum was found non-significant at harvest. Numerically taller (93.76cm) plant was observed under T_{10}-Only Recommended Dose of fertilizer (RDF) treatment. Application of Only Recommended Dose of fertilizer (RDF) was found significantly highest dry matter production as compared to remaining treatment combinations. The increase in the dry matter accumulation production in black gram may be attributed to the proper supply of Recommended Dose of fertilizer, maximum plant height Kundu *et al.* (2017) [4] and Meena (2006) [5].

Table 1: Effect of different levels of phosphorus and Molybdenum on growth and yield attribute of black gram

Treatments	Plant height (cm) at harvest	Dry weight (g plant^{-1}) at harvest	No. of pods plant^{-1}	Length of pods(cm^{-1})	No. of seed pods^{-1}	Test weight(g)
T_1-Phosphorus 30 kg/ha + Mb 0.5 kg/ha.	84.42	6.14	17.2	5.31	6.49	33.01
T_2-Phosphorus 30 kg/ha+ Mb 1.0 kg/ha.	85.53	6.31	18.12	4.53	6.82	33.96
T_3-Phosphorus 30 kg/ha + Mb 1.5 kg/ha.	86.68	6.71	18.98	5.78	6.98	34.31
T_4-Phosphorus 40 kg/ha+ Mb 0.5 kg/ha.	88.31	6.93	19.88	5.95	7.18	32.75
T_5-Phosphorus 40 kg/ha + Mb 1.0 kg/ha.	89.29	7.05	19.67	6.28	7.49	35.13
T_6-Phosphorus 40 kg/ha + Mb 1.5 kg/ha.	90.16	7.56	21.94	6.40	7.77	35.87
T_7-Phosphorus 50 kg/ha + Mb 0.5 kg/ha.	90.85	7.8	22.92	6.61	7.99	35.96
T_8-Phosphorus 50 kg/ha+ Mb 1.0 kg/ha.	91.72	7.67	23.96	6.79	8.21	36.00
T_9-Phosphorus 50 kg/ha + Mb 1.5 Kg/ha.	92.93	7.56	25.12	6.87	8.62	37.31
T_{10}-Only Recommended Dose of Fertilizer (RDF).	93.76	7.76	26.98	7.10	8.91	38.12
S.Em±	1.023	0.114	0.456	0.160	0.096	0.370
C.D. (P=0.05)	NS	0.341	1.364	0.478	0.287	1.108

Effect of treatments on yield attribute of black gram

Increases in the growth-related characteristics (plant height and dry matter accumulation) eventually showed up in the yield-related characteristics *viz.* number of pods plant^{-1}, Length of pods (cm^{-1}), number of seed pods^{-1} and test weight; which were recorded higher (26.9, 7.10, 8.91 and 38.12 respectively) with application of Only Recommended Dose of fertilizer (RDF). It could be because of the intricate interactions between its constituent parts, which are influenced by the development cycle during vegetative stages and manifested during productive phases. Numerous factors that contribute to development and output were enhanced by sufficient doses of fertilizers. A number of researchers, including Adkine *et al.*, (2011) [1] and Ali *et al.*, (2010).

Effect of treatments on Yield of black gram

The sum of all agronomic inputs that affect a crop's growth and yield-attributing characteristics during its life cycle is its yield. The contribution of several elements to economic yield is used to rate each one's effectiveness. Higher seed yield, stover yield, biological yield and harvest index (1378.07, 2340.21, 3718.28 kg ha^{-1} and 37.06% respectively) were obtained with application of Only Recommended Dose of fertilizer. Black gram yield increased as a result of nutrient management practices that had a positive impact on several yield-contributing characters, including the number of pods plant^{-1}, Length of pods (cm^{-1}), number of seed pods^{-1} and test weight, and growth characters (plant height and accumulation of dry matter). Tiwari *et al.*, (2015) [8] and Kumar *et al.*, (2014) [3] have previously reported on this impact of organic and inorganic treatment on black gram output.

Effect of treatments on economics of black gram

The maximum cost of cultivation (22,987 Rs. ha^{-1}) was incurred under treatment (T_{10}-Only Recommended Dose of fertilizer (RDF)) against the lowest cost of cultivation under T_1-Phosphorus 30 kg/ha + Mb 0.5 kg/ha (20,460 Rs. ha^{-1}) in all nutrient management practices regarded higher gross

return and net return over control (Table. 2). The maximum gross return (67185 Rs. ha^{-1}) was obtained under Only Recommended Dose of fertilizer condition against lowest gross income (48387 Rs. ha^{-1}) under T_1-Phosphorus 30 kg/ha + Mb 0.5 kg/ha. Maximum return (44198 Rs. ha^{-1}) under Only Recommended Dose of fertilizer condition against the lowest net return (27927 Rs. ha^{-1}) under T_1-Phosphorus 30 kg/ha + Mb 0.5 kg/ha. Highest benefit cost ratio (21.9) was produced under T_9-Phosphorus 50 kg/ha + Mb 1.5 Kg/ha treatment and lowest benefit cost ratio (1.36) under T_1-Phosphorus 30 kg/ha + Mb 0.5 kg/ha. Similar results have been also reported by Dubey *et al.* (2015) [2] and Patil *et al.* (2014) [6].

Table 2: Effect of different levels of phosphorus and Molybdenum on growth and yield attribute of black gram

Treatments	Seed yield (kg.ha.$^{-1}$)	Stover yield (kg.ha.$^{-1}$)	Biological yield (kg.ha.$^{-1}$)	Harvest index (%)	Cost of cultivation (Rs. ha^{-1})	Gross return (Rs. ha^{-1})	Net return (Rs. ha^{-1})	B:C ratio
T_1-Phosphorus 30 kg/ha + Mb 0.5 kg/ha	800.21	1853.00	2653.21	30.16	20,460	48,387	27927	1.36
T_2-Phosphorus 30 kg/ha+ Mb 1.0 kg/ha	824.87	1911.04	2735.91	30.14	20,734	50,927	30193	1.45
T_3-Phosphorus 30 kg/ha + Mb 1.5 kg/ha	958.30	1984.17	2942.47	32.56	21,439	53,930	34975	1.63
T_4-Phosphorus 40 kg/ha+ Mb 0.5 kg/ha	982.39	2030.01	3012.4	32.61	20,841	55,816	34975	1.67
T_5-Phosphorus 40 kg/ha + Mb 1.0 kg/ha	1131.35	2122.07	3253.42	34.77	21,749	59,989	38240	1.75
T_6-Phosphorus 40 kg/ha + Mb 1.5 kg/ha	1170.31	2256.11	3426.42	34.15	21,931	61,830	39899	1.81
T_7-Phosphorus 50 kg/ha + Mb 0.5 kg/ha	1125.92	2103.12	3229.04	34.86	21,593	58,731	37141	1.72
T_8-Phosphorus 50 kg/ha+ Mb 1.0 kg/ha	1035.56	2290.10	3325.66	31.13	21,924	58,946	37022	1.68
T_9-Phosphorus 50 kg/ha + Mb 1.5 Kg/ha	1330.21	2303.16	3633.37	36.61	22,852	66,964	44112	1.93
T_{10}-Only Recommended Dose of Fertilizer (RDF)	1378.07	2340.21	3718.28	37.06	22,987	67,185	44198	1.92
S.Em±	22.967	38.967	51.294	0.574				
C.D. (P=0.05)	68.766	NS	153.583	NS				

Conclusion

It can be concluded from the present investigation that different levels of phosphorus and molybdenum with T_{10}-Only Recommended Dose of Fertilizer (RDF) enhance growth attributing characters at different crop stages and yield attributing characters at harvest along with higher seed, straw yield with net return of black gram. In terms of benefit cost ratio of black gram treatment T_9-Phosphorus 50 kg/ha + Mb 1.5 Kg/ha was produced maximum B: C ratio.

References

1. Adkine PM, Mankar DD, Khandait VM, Bhandare VL, Nawlakhe SM. Effect of boron, molybdenum and potassium nitrate on growth, yield and economics of black gram. Journal of Soils and Crops. 2011;21(1):116-123.
2. Dubey SD, Diwakari AK, Tripathi AK, Tiwari US, Pandey R. Response of linseed (*Linum usitatissium*) and Indian mustard (*Brassica juncea*) to integrated nitrogen management in central plain zone of Uttar Pradesh. Current Advances in Agricultural Sciences. 2015;7(1):62-64.
3. Kumar S, Tomar S, Tomar TS. Integrated phosphorus management in blackgram (*Vigna mungo*) in western Utter Pradesh during summer season. Annals of Agriculture Res. 2014;5(3):290-297.
4. Kundu KM, Mandi SK, Hasim Reja MD, Maji S, Nath R. Evaluation of pre-released bold seeded lentil varieties on different weather factors for growth and yield potentiality in the new alluvial zone of West Bengal, India. International Journal of Current Microbiology and Applied Sciences. 2017;6(9):758-771.
5. Meena KR, Dahama AK, Reager ML. Effect of phosphorus and zinc fertilization on growth and quality of cluster Literature cited 79 bean (*Cyamopsis tetragonoloba* (L.) TAUB). Ann. agric. Res., New Series. 2006;27(3):224-226.
6. Patil SS, Choudhary AA, Goley AV, Rasal SJ. Effect of phosphorus and sulphur on growth, yield and economics of linseed. Journal of Soils and Crops. 2014;24(1):159-164.
7. Shweta, Malik M. Response of pulse production to phosphorus Agricultural Research Communication center Agri. Review. 2014;35(4):295-298.
8. Tiwari PK, Kumar A, Kumar S, Ram Bharose, Kumar M, Parkashved. Effect of Rhizobium Inoculation and phosphorus levels on yield attributes and yield of summer mung bean. Annals of Plant and Soil Research. 2015;17(13):326-327.